MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2017/2018

PTM0145 – TRIGONOMETRY

(Foundation in Information Technology / Life Sciences)

4 JUNE 2018
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **TWO** pages excluding the cover page and the Appendix.

2. Answer **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

4. All necessary working steps **MUST** be shown.

Instruction: Answer all **FIVE** questions.

Question 1 [10 marks]

a. Given that $z_1 = 6\left(\cos\frac{3\pi}{2} + i\sin\frac{3\pi}{2}\right)$ and $z_2 = 12\left(\cos\frac{5\pi}{6} + i\sin\frac{5\pi}{6}\right)$. Find $z_1 z_2$ and $\frac{z_2}{z_1}$, and leave your answer in $a+bi$ form. (4 marks)

b. Given $z = 2-2i$. Convert z into polar form and calculate z^3. Leave your answer in polar form. (6 marks)

Question 2 [10 marks]

a. Find an equation for the parabola with focus at $(4,1)$ and vertex at $(4,-4)$. (3 marks)

b. Find the center, vertices and foci for the ellipse $4x^2 + 25y^2 - 24x + 100y + 36 = 0$. Then graph the ellipse (7 marks)

Question 3 [10 marks]

a. If $\cos\alpha = -\frac{7}{25}$, $\frac{\pi}{2} \le \alpha \le \pi$ and $\sin\beta = -\frac{\sqrt{21}}{5}$, $\pi < \beta < \frac{3\pi}{2}$, find the exact value of the following:

i. $\cos(\alpha+\beta)$ (3 marks)

ii. $\sin\frac{\beta}{2}$ (2 marks)

b. Solve the following equation for $0 \le x \le 2\pi$:

$\cos 2x - \sin x = 1$ (5 marks)

Continued...

Question 4 [10 marks]

a. Establish the identity.

$$\frac{\cos x}{1-\sin x} = \frac{1+\sin x}{\cos x}.$$

(3 marks)

b. Solve the triangle where $a = 5$, $b = 7$ and $B = 42°$. (7 marks)

Question 5 [10 marks]

Solve the following linear system using the inverse method.

$$\begin{aligned} 2x+4y-5z &= -8 \\ x+5y+2z &= -1 \\ 3x+3y+3z &= 15 \end{aligned}$$

(10 marks)

End of Paper

APPENDIX

Trigonometry Identities

$$\cos^2 A + \sin^2 A = 1 \qquad \sec^2 A = 1 + \tan^2 A \qquad \csc^2 A = 1 + \cot^2 A$$

$$\cos(A+B) = \cos A\cos B - \sin A\sin B$$
$$\cos(A-B) = \cos A\cos B + \sin A\sin B$$
$$\sin(A+B) = \sin A\cos B + \cos A\sin B$$
$$\sin(A-B) = \sin A\cos B - \cos A\sin B$$
$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A\tan B}$$
$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A\tan B}$$

$$\cos 2A = \cos^2 A - \sin^2 A$$
$$= 2\cos^2 A - 1 = 1 - 2\sin^2 A$$
$$\sin 2A = 2\sin A\cos A$$
$$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$$

$$\sin A\cos B = \frac{1}{2}[\sin(A+B) + \sin(A-B)]$$
$$\cos A\cos B = \frac{1}{2}[\cos(A+B) + \cos(A-B)]$$
$$\sin A\sin B = \frac{1}{2}[\cos(A-B) - \cos(A+B)]$$

$$\sin A + \sin B = 2\sin\frac{A+B}{2}\cos\frac{A-B}{2} \qquad \sin A - \sin B = 2\cos\frac{A+B}{2}\sin\frac{A-B}{2}$$

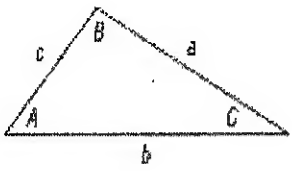
$$\cos A + \cos B = 2\cos\frac{A+B}{2}\cos\frac{A-B}{2} \qquad \cos A - \cos B = -2\sin\frac{A+B}{2}\sin\frac{A-B}{2}$$

$$\sin^2\frac{A}{2} = \frac{1-\cos A}{2} \qquad \cos^2\frac{A}{2} = \frac{1+\cos A}{2} \qquad \tan^2\frac{A}{2} = \frac{1-\cos A}{1+\cos A}$$

$$\sin\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{2}} \qquad \cos\frac{A}{2} = \pm\sqrt{\frac{1+\cos A}{2}} \qquad \tan\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{1+\cos A}}$$

$$\tan\frac{A}{2} = \frac{1-\cos A}{\sin A} = \frac{\sin A}{1+\cos A}$$

Triangles



Law of Sines:

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Law of Cosines:

$$c^2 = a^2 + b^2 - 2ab\cos C$$
$$b^2 = a^2 + c^2 - 2ac\cos B$$
$$a^2 = b^2 + c^2 - 2bc\cos A$$

Area of a Triangle: $A = \frac{1}{2}ab\sin C = \frac{1}{2}bc\sin A = \frac{1}{2}ac\sin B$

$$A = \sqrt{s(s-a)(s-b)(s-c)} \quad \text{where} \quad s = \frac{1}{2}(a+b+c)$$

Polar Coordinates

$$x = r\cos\theta$$
$$y = r\sin\theta$$
$$r = \sqrt{x^2 + y^2}$$
$$\tan\theta = \frac{y}{x}$$